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The Effect of Different Surface Treatments of Shear Bond Strength of Repaired Polymer-infiltrated Ceramic Network Materials

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Abstract

Objectives: This study aimed to determine the alternative surface treatment method for repairing aged polymer-infiltrated ceramic network materials (PICNs) utilizing a shear bond strength (SBS) test.

Methods: A PICNs block (VITA Enamic®) was cut into 5x5x5 mm^3 followed by thermocycling for 10,000 cycles. The specimens were then randomly divided into four groups (n=12), based on different surface treatments. Group HF+Si: treated with a 9.5% hydrofluoric acid and silane application, Group HF+Si+He: treated with a 9.5% hydrofluoric acid and silane application followed by an application of a hydrophobic resin monomer, Group MEP: treated with a self-etching ceramic primer, Group MEP+He: treated with a self-etching ceramic primer followed by an application of a hydrophobic resin monomer. All specimens were repaired with a resin composite and underwent a thermocycling aging process for 10,000 cycles before measuring shear bond strength.

Results: One-way ANOVA revealed a significant difference in SBS among all groups. Group MEP exhibited a significantly lowest mean SBS value ($p<0.05$), while, mean SBS values from groups HF+Si, HF+Si+He, and MEP+He did not show statistically significant differences.

Conclusions: Treating aged PICNs with only self-etching ceramic primer group provided an insufficient shear bond strength. However, when a hydrophobic resin monomer was applied after conditioning with self-etching ceramic primer, shear bond strength was distinctly improved to a comparable level to those treated with 9.5% hydrofluoric acid and silane primer.

Keywords: hydrofluoric acid, hyphobic resin monomer, self-etching ceramic primer, silane, PICNs